



Combining VMAT and Multi-Scan CBCT Technique for Craniospinal Irradiation On a Conventional Linac

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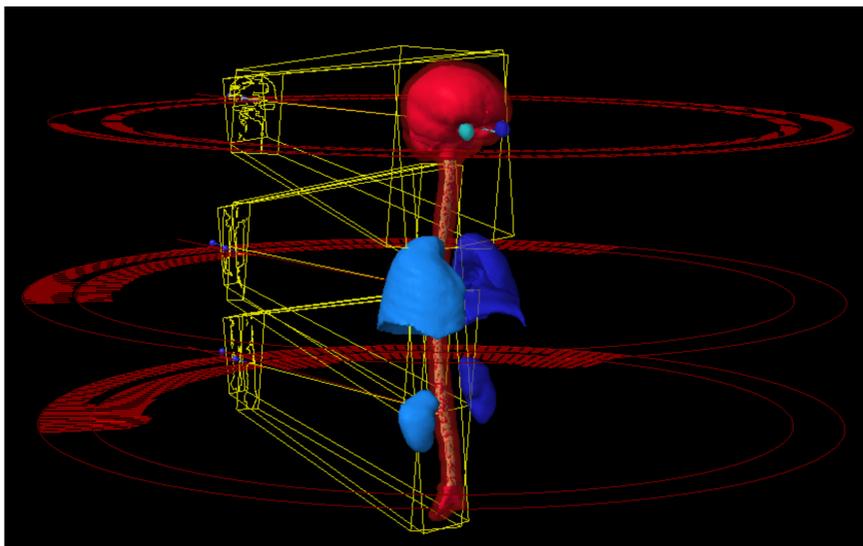
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PURPOSE

Therapeutic and prophylactic cranio-spinal irradiation (CSI) can be used in the treatment of hematologic malignancies. In those cases, CTV is defined as the entire neuraxis. Delivering CSI on a conventional linac is challenging, existing different techniques varying between centers. Considering Tomotherapy, the technique is simplified, however its availability is limited. Conventional linacs allow the delivery of volumetric-modulated arc therapy (VMAT) treatments in combination with cone-beam (CBCT) techniques, enabling a safer approaching for CSI treatments on conventional linacs.

METHODS

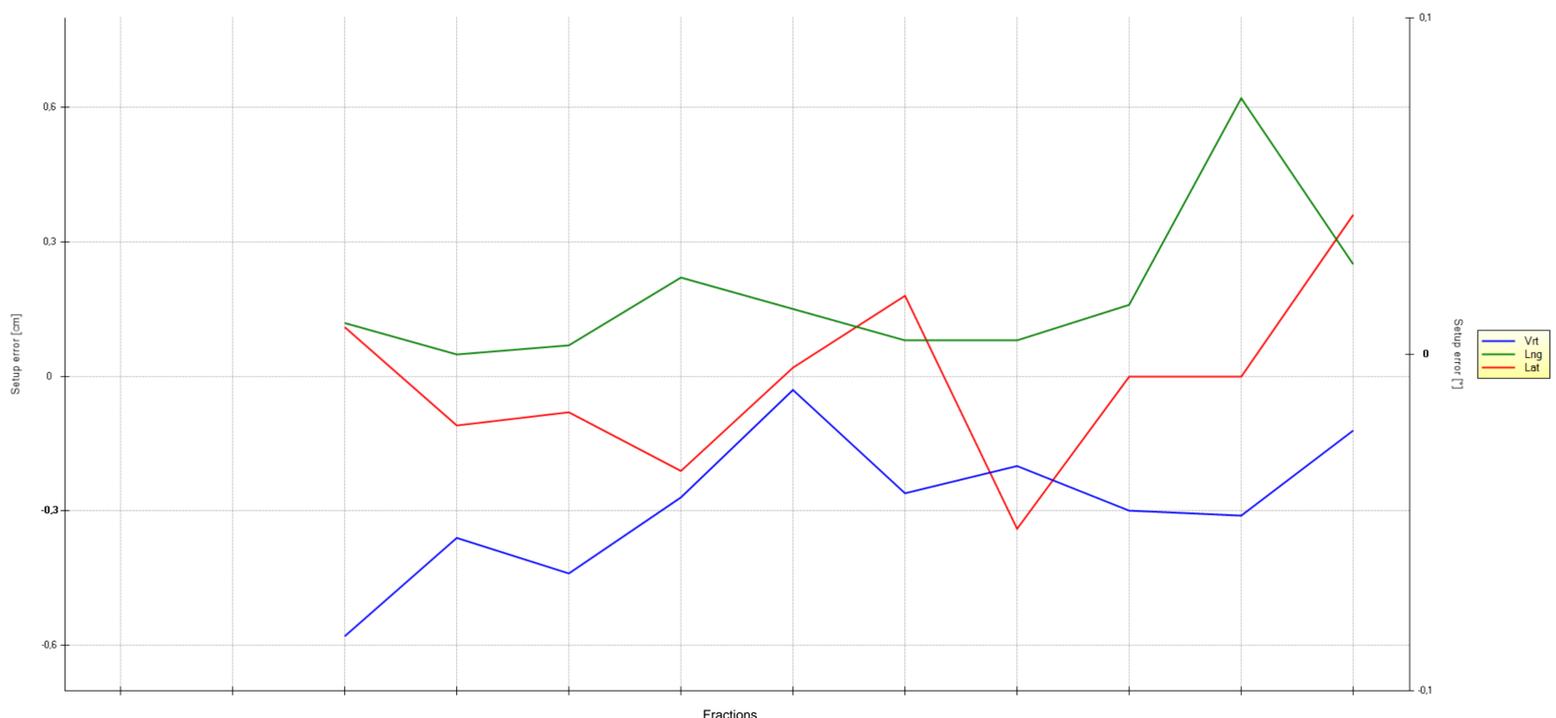
VMAT treatments were delivered in our institution with a 6 MV TrueBeam (Varian). Plans were generated with Eclipse v. 16 (Varian). A multi-isocentric VMAT technique involving three isocenters (cranial, upper spine and lower spine) was implemented, keeping the same vertical and lateral coordinates for each location. Two arcs were planned for each isocenter (full for cranial, and partial -avoiding arms-for upper and lower spine). Adjacent arcs were overlapped, creating dosimetric feathering in the neck and mid spine region. Patient-specific QA consisted on point-dose measurements, Portal Dosimetry (Varian) and Octavius4D (PTW) measurements for each single isocenter, and additional Octavius4D measurements in the overlapping regions (upper and lower).



In order to check the patient setup for its entire anatomy, a multi-scan CBCT was performed prior to the treatment, involving five CBCTs acquisitions, enabling an approximate reconstructed length of 80 cm. Then, a three-degrees-of-freedom matching (avoiding rotations) was performed using the total reconstructed length. Prior to delivery, a new single CBCT was acquired for each isocenter, to ensure patient positioning and setup robustness.

RESULTS

Treatment times ranged from 30-40 minutes. Mean setup errors were -0.31 ± 0.15 cm, -0.05 ± 0.16 cm and 0.17 ± 0.18 cm in the antero-posterior, lateral and cranio-caudal directions, respectively.



CONCLUSION

A CSI technique based on VMAT delivery and multi-scan CBCT was successfully implemented in our institution, enabling a safer way for neuroaxis treatments.